

National Aeronautics and Space Administration



Evaluating Models of Human Performance: Safety-Critical Applications

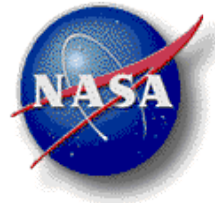
Michael Feary
HSS Technical Lead

HFES Annual Meeting
May 24, 2012

www.nasa.gov



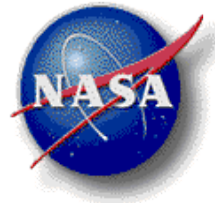
Human Performance Modeling in Safety-Critical, Mixed-Initiative Domains



- Focusing on evaluations of acceptability as well as optimality
- Need to account for distributions of behavior
- Tasks as the linkage for complex system evaluation
- Increased use of automation emphasizes need for evaluation of attention

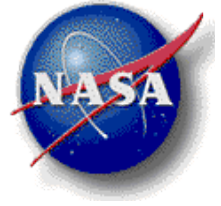


Cognitive Modeling for Safety Critical, Mixed-Initiative Applications

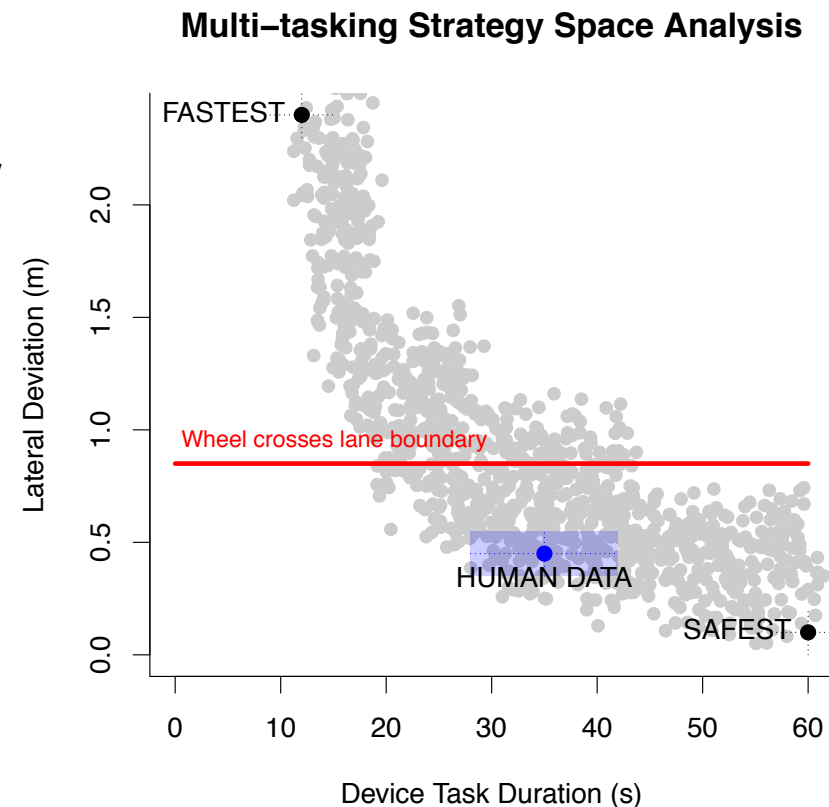


- Supporting Tradeoff Decisions
 - Social Penetration: Characterizing the problem space
 - Focus on evaluating the correct questions
 - Metricity: Avoiding the Illusion of precision
 - Applicability, Uncertainty
 - Robustness: Defining strategic variation
 - Data Applicability: Identifying the measurement needs

Limitations: Bridging the Granularity Gap

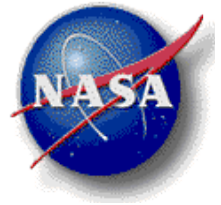


- New architectures
 - Bounded Optimality – focus on the problems the human has
 - Strategy Generation – focus on how goals could be achieved, strategic variation

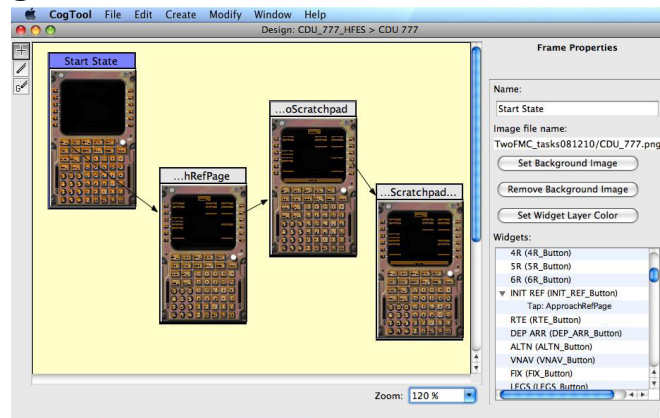


(Brumby, Howes, Salvucci, 2007)

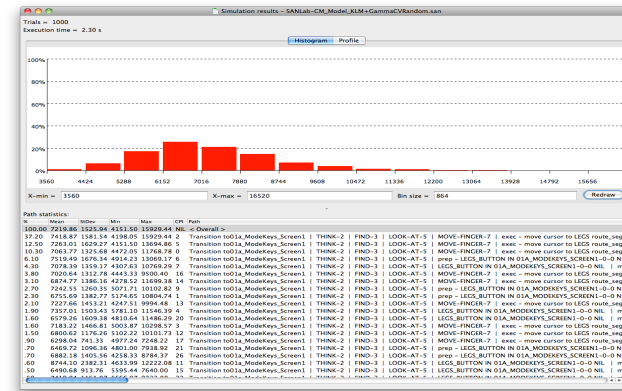
Limitations: Bridging the Granularity Gap



- New Tools for Domain Experts
 - CogTool

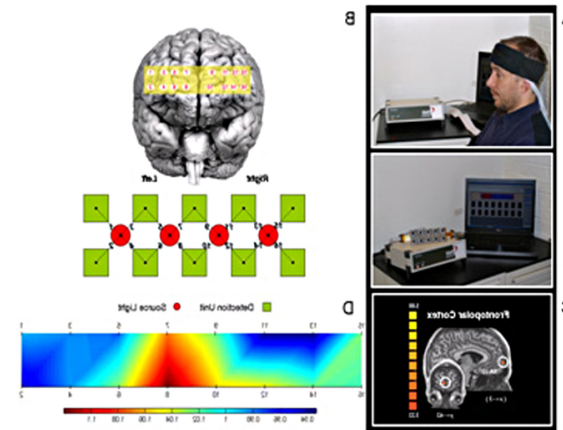


CogTool (John et al., 2004)



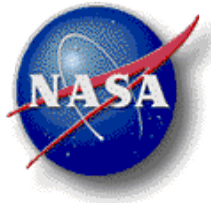
SanLab, Gray

- New empirical measures
 - Focus on attention
 - eye tracking
 - fnirs images
 - EEG

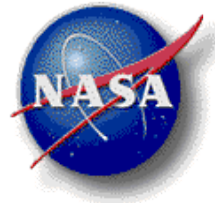


Portable fNIRS

Thank You



Taxonomy



	ATTRIBUTE	1 (LEAST)	2 (MODERATE)	3 (MOST)
A	DATA APPLICABILITY	No basis in existing data	Describes existing data	Predicts future data
B	DIMENSIONALITY	Single input, single output	Multi input, single output	Multi input, multi output
C	METRICITY	Limited to nominal relationships	Primarily ordinal relationships	Entirely cardinal relationships
D	ROBUSTNESS	Unique focus on limited objects or events	Moderate focus to a variety of objects or events	Comprehensive of a wide slice of nature
E	SOCIAL PENETRATION	Confined to a mental model	Communicated to the relevant community	Accepted and used by the relevant community